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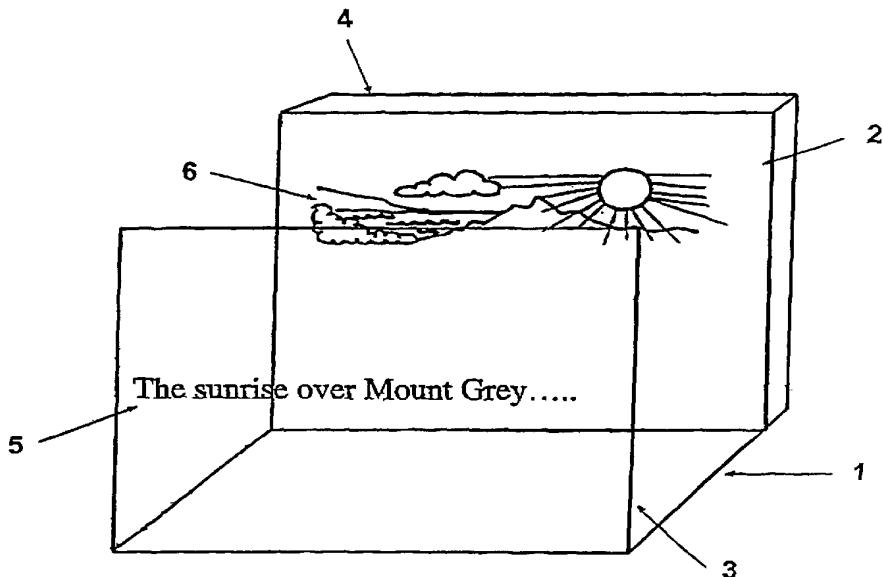
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(54) Title: INFORMATION DISPLAY



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(57) Abstract: A method displaying information for viewing by a user characterised by the steps of: peripherally displaying primary information (5) on a first focal plane (3), and displaying secondary information (6) on at least a second focal plane (2) to said primary information (5), wherein said secondary information (6) exhibits at least one characteristic capable of augmenting the effect of the primary information (5) on the viewer.



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## INFORMATION DISPLAY

TECHNICAL FIELD

The present invention relates generally to an information display and more specifically to multi focal plane information displays and a method of enhancing information extraction from same.

BACKGROUND ART

Any potential improvements in the input speed, comprehension and/or retention of information gained via reading would be clearly beneficial to a wide spectrum of users in many diverse applications.

10 It is believed that use may be made of the readers subconscious to enhance the recognised conscious reading mechanisms typically employed during the reading of books, computer screens, visual displays and so forth. Current means of increasing the quantity of information available to the reader have largely involved decreasing the font size to provide a greater quantity of text surface area. However, this technique 15 fails to overcome the inherent limitations of the human eye, i.e. reducing the text font size below a certain level causes a significant reduction in readability.

Menus, layering, pop-up windows and so forth have been used single focal plane prior art displays as alternative means of enhancing the quantity of information available to the reader without making the display overly cluttered.

20 Although the use of menus and similar hierarchical display methods do enable the user to access the required information without the need for large display surfaces or undue display clutter, they reduce the viewer's situational awareness. Moreover, they require positive interaction by the user, which is not always practical or desirable and are

unavoidably slower to use than continuously displayed information.

Multi-layer or multi-focal plane displays have been utilised to address the above difficulties whereby two or more display screens at least partially overlap, displaying information in two or more distinct focal planes. The viewer may thus focus on the 5 individual screens to view the information displayed thereon without accessing a menu or needing to make significant head/eye movements to scan large display surfaces.

Research such as the *Transparent Layered User Interfaces: An Evaluation of a Display Design to Enhance Focused and Divided Attention*, Harrison et al, *CHI 95 Conference* (1995) examined the link of transparent displays on focused and/or divided attention.

10 Examples of focused attention include a computer software dialog box or warning message interrupting a user concentrating on a document, or part of a display screen being temporarily obscured by a drop-down menu.

Divided attention examples provided by *Harrison et al* include using a video display showing a colleague during collaborative work, where the participant's attention is 15 shared between the colleague and the work in progress, e.g., a drawing or document.

*Harrison et al* considered cases of individuals needing to time-share two information items or 'tasks' (divided attention), and cases where individuals selectively attend to one task excluding the other (focused attention). However, no specific exploration is made of the potential benefit of the unfocused information item on an individual focusing on 20 another information item/task.

Various means of simultaneously displaying and analysing large literary text is disclosed at the TextArc™ website <http://textarc.org> (15<sup>th</sup> April 2002). The display techniques employed are highly unusual and innovative. In one embodiment, the entire text of a novel for example, is arranged in concentric spirals. Each successive line of 25 the novel is written in miniature around the outside of the spiral, with frequently

occurring words also being displayed in a larger font within the spiral arc. The frequency of occurrence within the document is denoted by the word's intensity or luminance, while its location is determined by the mean geometrical position between occurrences about the outer spiral. Additional displays of the text in a conventional 5 form may be overlaid on the spiral arc representation, enhancing the pre-attentive possibilities for the viewer. As the viewer scrolls through the conventional text, the high frequency words are illuminated within the spiral, together with radial lines extending to each point in the spiral containing the word.

A viewer may thus see a measure of a word's significance, its interconnection to other 10 words and its effective location within a document. The viewer is thus presented with exposure to the bottom up structure of the entire document and to a variety of interrelationships between the contents.

However, the combined/overlapping display obscures a portion of the text spiral arrangement. Furthermore, the sheer wealth of visual input in one focal plane may be 15 distracting and hinder preattentive intake by the viewer.

Further prior art work by Ishii H et al, "Iterative Design of Seamless Collaboration Media", Communications of the ACM (CACM), ACM, Vol 37, No. 8, August 1994, and the work described at the web sites <http://web.media.mit.edu/~ishii/TWS.html>, and <http://web.media.mit.edu/~ishii/CB.html> by the same authors discusses combination 20 computer display/whiteboard-type transparent displays. The issue addressed by Ishii et al is creating a usable work space environment combining the benefits of a computer screen interface, a physical desktop and a dual sided transparent glass-board. The resultant system provides a display surface on which the images of collaborative workers appear to face the user whilst any text/drawing written by any of the 25 collaborators/users automatically appears with the correct orientation on the combined display. This overcomes the problem of inversion caused by collaborating users writing on opposing sides of a common transparent panel. The meaning of facial

gestures and body language nuances of the collaborators regarding particular items in the workspace screen may be easily discerned. However, again the display surface is essentially a single focal plane and thus does not take full advantage of the preattentive depth-related capabilities of the user, as described below.

- 5 The benefits of multi-layered viewing screens, in particular those utilising the technology described in the co-pending Patent Application Nos. NZ314566, NZ328074, NZ329130, PCT/NZ98/00098 and PCT/NZ99/00021 are gaining increasingly widespread recognition and acceptance due to their enhanced capabilities compared to conventional single focal plane displays.
- 10 The basic principle of known multi-focal plane displays is that the viewer consciously applies their attention to one of the focal planes individually or to a composite image found by the combination of images displayed on at least partially transparent screens.

Therefore, although the viewing experience may be enriched by the potential sense of depth provided by such composite displays, it has not been utilised thus far as a means

- 15 of enhancing the reading/image assimilation speed of the viewer, nor of using the information displayed on one focal plane to improve the net effect on a user consciously viewing the display on a separate focal plane. Such improved effects could include improvements in comprehension, perception, retention, recall, interpretation and/or association with related information.

- 20 The manner in which human beings process visual information has been the subject of extensive and prolonged research in an attempt to understand this complex process. The term preattentive processing has been coined to denote the act of the subconscious mind in analysing and processing visual information which has not become the focus of the viewer's conscious awareness.
- 25 When viewing a large number of visual elements, certain variations or properties in the visual characteristics of elements can lead to rapid detection by preattentive processing.

This is significantly faster than requiring a user to individually scan each element, scrutinising for the presence of the said properties. Exactly what properties lend themselves to preattentive processing has in itself been the subject of substantial research. Colour, shape, three-dimensional visual clues, orientation, movement and 5 depth have all been investigated to discern the germane visual features that trigger effective preattentive processing.

Researchers such as Triesman [1985] conducted experiments using target and boundary detection in an attempt to classify preattentive features. Preattentive target detection was tested by determining whether a target element was present or absent within a field 10 of background distractor elements. Boundary detection involves attempting to detect the boundary formed by a group of target elements with a unique visual feature set within distractors. It maybe readily visualised for example that a red circle would be immediately discernible set amongst a number of blue circles. Equally, a circle would be readily detectable if set amongst a number of square shaped distractors. In order to 15 test for preattentiveness, the number of distractors as seen is varied and if the search time required to identify the targets remains constant, irrespective of the number of distractors, the search is said to be preattentive. Similar search time limitations are used to classify boundary detection searches as preattentive.

A widespread threshold time used to classify preattentiveness is 200-250msec as this 20 only allows the user opportunity for a single 'look' at a scene. This timeframe is insufficient for a human to consciously decide to look at a different portion of the scene. Search tasks such as those stated above maybe accomplished in less than 200msec, thus suggesting that the information in the display is being processed in parallel unattendedly or pre-attentively.

25 However, if the target is composed of a conjunction of unique features, i.e. a conjoin search, then research shows that these may not be detected preattentively. Using the above examples, if a target is comprised for example, of a red circle set within

distractors including blue circles and red squares, it is not possible to detect the red circle preattentively as all the distractors include one of the two unique features of the target.

Whilst the above example is based on a relatively simple visual scene, Enns and 5 Rensink [1990] identified that targets given the appearance of being three-dimensional objects can also be detected preattentively. Thus, for example a target represented by a perspective view of a cube shaded to indicate illumination from above would be preattentively detectable amongst a plurality of distractor cubes shaded to imply illumination from a different direction. This illustrates an important principle in that 10 the relatively complex, high-level concept of perceived three-dimensionality may be processed preattentively by the sub-conscious mind. In comparison, if the constituent elements of the above-described cubes are re-orientated to remove the apparent three dimensionality, subjects cannot preattentively detect targets which have been inverted for example. Additional experimentation by Brown et al [1992] confirms that it is the 15 three-dimensional orientation characteristic that is preattentively detected. Nakaymyama and Silverman [1986] showed that motion and depth were preattentive characteristics and that furthermore, stereoscopic depth could be used to overcome the effects of conjoin. This reinforced the work done by Enns Rensink in suggesting that high-level information is conceptually being processed by the low-level visual system 20 of the user. To test the effects of depth, subjects were tasked with detecting targets of different binocular disparity relative to the distractors. Results showed a constant response time irrespective of the increase in distractor numbers.

These experiments were followed by conjoin tasks whereby blue distractors were placed on a front plane whilst red distractors were located on a rear plane and the target 25 was either red on the front plane or blue on the rear plane for stereo colour (SC) conjoin tests, whilst stereo and motion (SM) trials utilised distractors on the front plane

moving up or on the back plane moving down with a target on either the front plane moving down or on the back plane moving up.

Results showed the response time for SC and SM trials were constant and below the 250msec threshold regardless of the number of distractors. The trials involved conjoin  
5 as the target did not possess a feature unique to all the distractors. However, it appeared the observers were able to search each plane preattentively in turn without interference from distractors in another plane.

This research was further reinforced by Melton and Scharff [1998] in a series of experiments in which a search task consisting of locating an intermediate-sized target  
10 amongst large and small distractors tested the serial nature of the search whereby the target was embedded in the same plane as the distractors and the preattentive nature of the search whereby the target was placed in a separate depth plane to the distractors.

The relative influence of the total number of distractors present (regardless of their depth) verses the number of distractors present solely in the depth plane of the target  
15 was also investigated. The results showed a number of interesting features including the significant modification of the response time resulting from the target presence or absence. In the target absence trials, the reaction times of all the subjects displayed a direct correspondence to the number of distractors whilst the target present trials did not display any such dependency. Furthermore, it was found that the reaction times in  
20 instances where distractors were spread across multiple depths were faster than for distractors located in a single depth plane.

Consequently, the use of a plurality of depth/focal planes as a means of displaying information can enhance preattentive processing with enhanced reaction/assimilation times.

25 It is thus believed that a means of overcoming the above described drawbacks is available by harnessing the peripheral vision and subconscious perception of the reader

(particularly in conjunction with multi focal plane displays) to assimilate additional information sources simultaneously with the process of conventional reading in order to enhance the speed and effectiveness of the whole reading/viewing process.

The benefits of the multi-layered viewing screens, in particular those utilising the  
5 technology described in the co-pending Patent Application Nos. NZ314566, NZ328074, NZ329130, PCT/NZ98/00098 and PCT/NZ99/00021 are especially germane to displays using liquid crystal displays (LCD).

There are two main types of Liquid Crystal Displays used in computer monitors, passive matrix and active matrix. Passive-matrix Liquid Crystal Displays use a simple  
10 grid to supply the charge to a particular pixel on the display. Creating the grid starts with two glass layers called substrates. One substrate is given columns and the other is given rows made from a transparent conductive material. This is usually indium tin oxide. The rows or columns are connected to integrated circuits that control when a charge is sent down a particular column or row. The liquid crystal material is  
15 sandwiched between the two glass substrates, and a polarizing film is added to the outer side of each substrate.

A pixel is defined as the smallest resolvable area of an image, either on a screen or stored in memory. Each pixel in a monochrome image has its own brightness, from 0 for black to the maximum value (e.g. 255 for an eight-bit pixel) for white. In a colour  
20 image, each pixel has its own brightness and colour, usually represented as a triple of red, green and blue intensities. To turn on a pixel, the integrated circuit sends a charge down the correct column of one substrate and a ground activated on the correct row of the other. The row and column intersect at the designated pixel and that delivers the voltage to untwist the liquid crystals at that pixel.

25 The passive matrix system has significant drawbacks, notably slow response time and imprecise voltage control. Response time refers to the Liquid Crystal Displays ability

to refresh the image displayed. Imprecise voltage control hinders the passive matrix's ability to influence only one pixel at a time. When voltage is applied to untwist one pixel, the pixels around it also partially untwist, which makes images appear fuzzy and lacking in contrast.

5 Active-matrix Liquid Crystal Displays depend on thin film transistors (TFT). Thin film transistors are tiny switching transistors and capacitors. They are arranged in a matrix on a glass substrate. To address a particular pixel, the proper row is switched on, and then a charge is sent down the correct column. Since all of the other rows that the column intersects are turned off, only the capacitor at the designated pixel receives 10 a charge. The capacitor is able to hold the charge until the next refresh cycle. And if the amount of voltage supplied to the crystal is carefully controlled, it can be made to untwist only enough to allow some light through. By doing this in very exact, very small increments, Liquid Crystal Displays can create a grey scale. Most displays today offer 256 levels of brightness per pixel.

15 A Liquid Crystal Display that can show colours must have three subpixels with red, green and blue colour filters to create each colour pixel. Through the careful control and variation of the voltage applied, the intensity of each subpixel can range over 256 shades. Combining the subpixel produces a possible palette of 16.8 million colours (256 shades of red x 256 shades of green x 256 shades of blue).

20 Liquid Crystal Displays employ several variations of liquid crystal technology, including super twisted nematics, dual scan twisted nematics, ferroelectric liquid crystal and surface stabilized ferroelectric liquid crystal. They can be lit using ambient light in which case they are termed as reflective, backlit and termed Transmissive, or a combination of backlit and reflective and called transflective. There are also emissive 25 technologies such as Organic Light Emitting Diodes, and technologies which project an image directly onto the back of the retina which are addressed in the same manner as Liquid Crystal Displays. These devices are described hereafter as LCD panels

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the 5 cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

It is acknowledged that the term 'comprise' may, under varying jurisdictions, be 10 attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is 15 used in relation to one or more steps in a method or process.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

20 **DISCLOSURE OF INVENTION**

According to one aspect of the present invention there is provided a method displaying information for viewing by a user

characterised by the steps of:

- a) displaying primary information on a first focal plane, and

b) displaying secondary information on at least a second focal plane peripherally to said primary information, wherein said secondary information exhibits at least one characteristic capable of augmenting the effect of the primary information on the user.

5 As used herein, the primary information and secondary information may be comprised of alpha-numeric characters, symbols, plain text, images, animations, video sequences, a combination of same and any other means of visually representing information.

The terms primary and secondary information are not defined to infer or necessarily suggest any hierarchical relationship or degree of relative importance between the 10 primary and secondary information. Rather, the term primary information is simply denotes the information being viewed directly by the user and being interpreted by normal conscious thought processes associated with reading or viewing images.

The said effect of the secondary information on a user viewing the primary information may include, but is not limited to:

15 ■ an improved assimilation of the content or message contained by the primary information, including reading and/or comprehension speed;

■ an enhanced ability to perceive embedded, implied or related facts (directly or indirectly), links, nuances, innuendoes or associations regarding the primary information;

20 ■ a greater understanding and comprehension of the primary information;

■ improved retention and latent recall of the primary information;

■ more enjoyment than experienced by viewing the primary information in isolation.

The said augmenting effect on a user may be achieved by,

- displaying the secondary information on multiple focal planes, with substantially the same content and format as the primary information;
- displaying the secondary information on multiple focal planes, with substantially the same content in a different format and/or visual appearance to the primary information;
- displaying one of either the primary or secondary information on a rearward display screen before or after displaying the other of said primary or secondary information on a forward display screen.
- the application of variable format to either or both of said primary or secondary information including, but not limited to speed, colour, repetition, visual effects, motion, looming, scrolling, blinking, fading and/or size change.
- the static use of format including but not limited to speed, colour, repetition, visual effects, motion, looming, scrolling, blinking, fading and size change applied to either or both primary and/or secondary information.

15 ■ displaying graphics/images as at least part of said secondary information capable of eliciting a priming, pre-fetching, anticipating, associating or triggering response by a viewer viewing the primary information.

■ any and all combinations and/or permutations of the above.

According to a further aspect of the present invention, there is provided a multi-focal plane display including at least two at least partially overlapping display surfaces, capable of displaying Information according to the above-described method.

Thus, while prior research has included three attentional components, i.e., an individual's capacity to divide attention between two items, the ability to focus on any single item with minimal interference from other items and the recovery time/latency

involved in shifting attention between items, these fail to address the potential advantage/benefit of subconscious information assimilation during focused or divided attention activity.

The present invention may also incorporate existing technological applications  
5 displaying primary and secondary information, presently directed to use in single focal plane displays and/or wherein said secondary information lacks at least one characteristic capable of augmenting the effect of the primary information on the user.

Thus, according to a further aspect of the present invention, one of said primary or secondary information includes simultaneously displaying all or a substantial portion of  
10 a written work on either of said first and second focal planes.

Preferably, said written work is composed of text arranged in an enclosing geometric pattern, preferably a concentric spiral.

In one embodiment, recurring text items are displayed individually at a mean geometrical position between occurrences of the text item about the concentric spiral.

15 In a further embodiment, the text item frequency of occurrence document in the written work is denoted by a corresponding variation in intensity or luminance of the text item

Preferably, the other of said primary or secondary information includes displaying a portion of said written work.

As the viewer scrolls through the conventional text, the high frequency words are  
20 illuminated within the spiral, together with radial lines extending to each point in the spiral containing the word.

#### **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the

accompanying drawings in which:

Figure 1 shows a simplified perspective view of a dual screen display operating in accordance with a preferred embodiment of the present invention.

**BEST MODES FOR CARRYING OUT THE INVENTION**

5 Figure 1 shows a multi focal plane display operating in accordance with a preferred embodiment of the present invention. The display indicated by the general reference numeral (1) is preliminary comprised of a background screen (2) orientated parallel with, but spaced apart from a foreground screen (3). In the preferred embodiment shown in figure 1, both screens (2, 3) are transparent liquid crystal displays LCD 10 panels though the invention is not necessarily limited to same. A back-light (4) is located behind the rearward screen (2) to provide illumination for the whole display (1).

The display screens (2, 3) are each capable of displaying either primary (5) or secondary (6) information. Figure 1 shows primary information (5) displayed on the 15 forward screen (3) and secondary information (6) displayed on the rearward screen (2). It will be appreciated that the converse situation is equally feasible, ie the primary information (5) being displayed on the rearward screen (2) and vice versa. The primary information (5) and secondary information (6) may both be comprised of any form of text, symbols, alphanumeric characters, animations and so forth. However, the content 20 of the secondary information (6) is such that a user viewing the primary information (5) on the forward screen (3) would receive a beneficial affect due to some enhancing or augmenting quality of the secondary information (6). This enhancing quality may take many forms and these include, but are not limited to an increased reading and/or comprehension speed of the primary information (5), a greater retention, perception of 25 related information and so forth. As an example, a information passage describing a geographical location written in conventional text on the forward screen (3) the

primary information (5) in the form of being read by a user would fall within the definition of the primary information (5) in that the information would be the focus of the viewers conscious reading actions and occupying their direct attention. A representation of the content of the primary information (5) may be shown concurrently 5 in graphical form on the rearward screen (2) as the secondary information (6). This exemplary scenario is illustrated in figure 1 whereby the primary information (5) is a text passage describing the sunrise over a particular mountain feature and the secondary information provides a visual representation of the actual mountain and rising sun. The location of the rearward screen (2) in a second focal plane behind that 10 of the primary information on the forward screen (3) results in only a peripheral, subconscious awareness of the content of the secondary information to the user viewing the primary information (5).

The user will therefore experience a greater sense of the actual physical shape and surroundings to the feature described in the textual description(s) on the forward screen 15 (3) enhancing their reading experience.

An alternative technique to enhance the reading speed of a user is to display a particular piece of text as the primary information (5) on the forward screen (3) whilst displaying the next section of text to be read on the rearward screen (2) as the secondary information (6). The secondary information (6) thus pre-fetches the text 20 about to be read by the user and thus primes the users subconscious to be more receptive and aware of its content. It is believed that this subconscious imbibing of the additional text increases the quantity of information accessible by the mind and ultimately increases the reading speed and comprehension of the whole message.

Instead of displaying the secondary information (6) simultaneously with the primary 25 information (5), it may alternatively be shown slightly before or after displaying the primary information (5) respectively providing a pre-conditioning or re-enforcing effect on the user reading the primary information (5). It will be apparent to those

skilled in the art that many variations and permutations are possible regarding the content of the primary and secondary information (5, 6), the focal plane location/orientation of their respective displays (2,3), and the manner of displaying the primary and secondary information (5,6,) without departing from the scope and spirit 5 of the invention.

It will be equally apparent that the invention need not necessarily be comprised of information shown on exactly two liquid crystal displays, provided that the effect of viewing the primary information (5) (displayed in whatever form) is augmented by the peripheral assimilation of the secondary information (6) being displayed on one or 10 more focal planes distinct from the primary information (5).

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

**CLAIMS:**

1. A method displaying information for viewing by a user characterised by the steps of:
  - peripherally displaying primary information on a first focal plane, and
  - displaying secondary information on at least a second focal plane to said primary information, wherein said secondary information exhibits at least one characteristic capable of augmenting the effect of the primary information on the user.
2. The method as claimed in claim 1, wherein the primary information and secondary information are selected from the group comprising alpha-numeric characters, symbols, plain text, images, animations, video sequences, a combination of same and any means of visually representing information.
3. The method as claimed in claim 1 or claim 2, wherein the said effect of the secondary information on a user viewing the primary information includes one or more of;
  - an improved assimilation of the content or message contained by the primary information;
  - an improved reading and/or comprehension speed;
  - an enhanced ability to perceive embedded, implied or related facts (directly or indirectly), links, nuances, innuendoes or associations regarding the primary information;
  - a greater understanding and comprehension of the primary information;

- improved retention of the primary information;
- improved latent recall of the primary information; and/or
- a more rewarding experience than obtained by viewing the primary information in isolation.

4. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by displaying the secondary information on multiple focal planes, with substantially the same content and format as the primary information.

5. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by displaying the secondary information on multiple focal planes, with substantially the same content in a different format and/or visual appearance to the primary information.

6. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by displaying one of either the primary or secondary information on a rearward display screen before or after displaying the other of said primary or secondary information on a forward display screen.

7. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by the application of variable format to either or both of said primary or secondary information including, but not limited to speed, colour, repetition, visual effects, motion, looming, scrolling, blinking, fading and/or size change.

8. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by the static use of format including but not limited to speed, colour, repetition, visual effects, motion, looming,

scrolling, blinking, fading and size change applied to either or both primary and/or secondary information.

9. The method as claimed in any one of the preceding claims, wherein the said augmenting effect on a user is achieved by displaying graphics/images as at least part of said secondary information capable of eliciting a priming, prefetching, anticipating, associating or triggering response by a viewer viewing the primary information.
10. The method as claimed in any one of the preceding claims, wherein one of said primary or secondary information includes simultaneously displaying all or a substantial portion of a written work on a single focal plane.
11. The method as claimed in claim 10, wherein said written work is composed of text items arranged in an enclosing geometric pattern, preferably a concentric spiral.
12. The method as claimed in claim 10 or claim 11, wherein recurring text items are *displayed individually at a mean geometrical position between occurrences* of the text item about the concentric spiral.
13. The method as claimed in any one of claims 10-12, wherein the text item frequency of occurrence in the written work is denoted by a corresponding variation in intensity or luminance of the text item.
14. The method as claimed in any one of claims 10-13, wherein the other of said primary or secondary information includes displaying a portion of said written work in a conventional typographical layout.
15. The method as claimed in any one of claims 10-14, where in use, as a viewer reads said portion of the written work, text items occurring in said portion and occurring more than once in the whole written work are illuminated within the

geometric shape.

16. The method as claimed in claim 15, wherein in use, as a viewer reads said portion of the written work, text items occurring in said portion and occurring more than once in the whole written work are displayed with radial lines extending to each point in the spiral containing the word.
17. A multi-focal plane display including at least two at least partially overlapping display surfaces, capable of displaying information according to the method as claimed in any one of claims 1-16.
18. A method substantially as herein before described, with reference to, and as shown in the accompanying drawing.
19. A multi-focal plane display substantially as herein before described, with reference to, and as shown in the accompanying drawing.

1/1

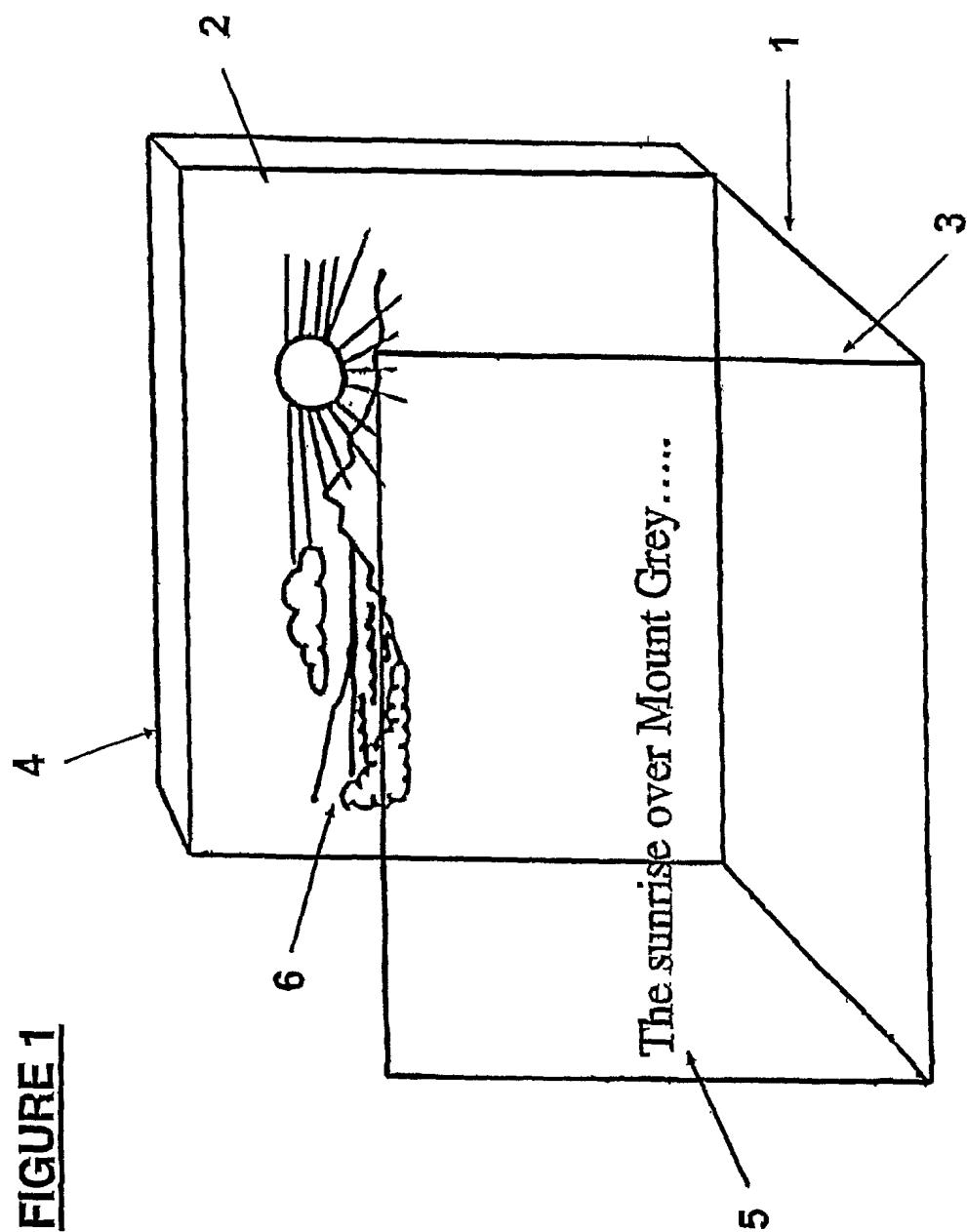


FIGURE 1

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NZ02/00079

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>																						
Int. Cl. <sup>7</sup> : G09F 19/14																						
According to International Patent Classification (IPC) or to both national classification and IPC																						
<b>B. FIELDS SEARCHED</b>																						
Minimum documentation searched (classification system followed by classification symbols)																						
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI IPC G06F, G06T, G09B, G09F and Keywords (display, multi, plane, focus) and like terms																						
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
X	WO 99/42889 A1 (POWER BEAT INTERNATIONAL LIMITED) 26 August 1999 page 8, lines 23-28 Fig. 1	1-3, 9, 17-19																				
X	WO 01/15128 A1 (DEEP VIDEO IMAGING LIMITED) 1 March 2001 Page 10, lines 4-14 Fig. 3	1-3, 9, 17-19																				
A	US 5764317 A (SADOVNIK ET AL) 9 June 1998 column 3, lines 19-42 Figs. 4A-4D																					
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C		<input checked="" type="checkbox"/> See patent family annex																				
<p>* Special categories of cited documents:</p> <table> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E"</td> <td>earlier application or patent but published on or after the international filing date</td> <td>"X"</td> <td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L"</td> <td>document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y"</td> <td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family	"P"	document published prior to the international filing date but later than the priority date claimed		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																			
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																			
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																			
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family																			
"P"	document published prior to the international filing date but later than the priority date claimed																					
Date of the actual completion of the international search 14 August 2002		Date of mailing of the international search report 3 SEP 2002																				
Name and mailing address of the ISA/AU  AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  <b>VINCE BAGUSAUSKAS</b> Telephone No : (02) 6283 2110																				

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ02/00079

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4472737 A (IWASAKI) 18 September 1984 Figs. 3, 9-11	
A	EP 0454423 A1 (TFE HONG KONG LIMITED) 30 October 1991 column 3, lines 8-42 Figs. 3a, 4a, 5a	
A	US 5367801 A (AHN) 29 November 1994 Column 3, lines 9-33 Figs. 1, 4, 6, 8	

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/NZ02/00079**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	99/42889	AU	82482/98	CA	2320694	EP	1057070
		JP	02/504764				
WO	01/15128		NONE				
US	5764317		NONE				
US	4472737		NONE				
EP	0454423		NONE				
US	5367801		NONE				
END OF ANNEX							